

ciety's Proceedings; and as Reporter for the present year, he announced that No. 29 of the Proceedings, to April last, would be issued in a day or two; and that both numbers would be distributed together to non-resident members.

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*Stated Meeting, May 17.*

Present, twenty-two members.

Dr. PATTERSON, Vice-President, in the Chair.

Letters were announced and read:—

From the Royal Bavarian Academy of Sciences at Munich, dated June 22, 1843, requesting an interchange of Transactions, &c., between the two Societies, and enclosing a list of the prizes proposed by the Mathematico-physical class of the Academy for the year 1843.

On motion of Mr. Kane, it was resolved that the Royal Bavarian Academy should be placed on the list of correspondents of the Society, and that the Transactions and Proceedings of the Society should be regularly transmitted to it.

From the New York Historical Society, dated New York, May 8, 1844, acknowledging the receipt of the Transactions of the Society:—

From the Baron de Ladoucette, dated Paris, February 20, 1844, on presenting a copy of a work of which he is the author:—

From Mr. C. J. Ingersoll, dated Washington, May 6, 1844, stating that his public occupations would render it impossible for him to perform the task assigned him, of delivering an obituary notice of the late Mr. Chew.

The following donations were announced:—

FOR THE LIBRARY.

Almanach der königlichen bayerischen Akademie der Wissenschaften. München, 1843. 12mo.—*From the Royal Academy of Sciences of Munich.*

- Journal of the Franklin Institute. Third Series. Vol. VII. May, 1844. No. 5.—*From Dr. Patterson.*
- Bulletin des Séances de la Société Royale et Centrale d'Agriculture, Compte rendu mensuel. Rédigé par M. Soulange Bodin, Vice-Sécrétaire. Tome 1er. 1837—1840. Paris, 1841. 8vo. Tome 2d. 1841, 1842. Paris, 1842. 8vo.—*From Mr. D. B. Warden, Paris.*
- Essai sur l'Instruction des Femmes, par Mme. la Comtesse de Groing la Maisonneuve. Troisième Édition. Tours, 1844. 12mo.—*From the same.*
- Amélioration du Régime Alimentaire des Hôpitaux, des Pauvres et des Grandes Réunions d'Hommes vivant en commun. Par M. D'Arcet. Paris, 1844. 8vo.—*From the same.*
- Nouvelles, par J. C. F. Ladoucette. Deuxième Édition. Paris, 1844. 8vo.—*From the Author.*
- Théorie des Machines Simples, en ayant égard au frottement de leurs parties, et à la roideur des cordages. Pièce qui a remporté le Prix double de l'Académie des Sciences pour l'Année, 1781. Par M. Coulomb. Paris, 1809. 4to.—*From Professor John F. Frazer.*
- Lectures on the more important Diseases of the Thoracic and Abdominal Viscera. Delivered in the University of Pennsylvania. By N. Chapman, M.D. Philadelphia, 1844. 8vo.—*From the Author.*
- On the Representation of Minorities of Electors to act with the Majority, in elected Assemblies. Philadelphia, 1844. 8vo.—*From Thomas Gilpin.*

Dr. Patterson gave an account of an automaton speaking machine, which Mr. Franklin Peale and himself had recently inspected.

The machine was made to resemble as nearly as possible, in every respect, the human vocal organs; and was susceptible of varied movements by means of keys. Dr. Patterson was much struck by the distinctness with which the figure could enunciate various letters and words. The difficult combination *three* was well pronounced—the *th* less perfectly but astonishingly well. It also enumerated diphthongs, and numerous difficult combinations of sounds. Sixteen keys were sufficient to produce all the sounds. In enunciating the simple sounds, the movements of the mouth could be seen. The

parts were made of gum elastic. The figure was made to say with a peculiar intonation, but surprising distinctness, "Mr. Pat-ter-son, I am glad to see you." It sang "God save Victoria," and "Hail, Columbia," the words and air combined. Dr. Patterson had determined to visit the maker of the machine, Mr. Faber, in private, in order to obtain farther interesting information; but on the following day Dr. P. was distressed to learn, that in a fit of excitement he had destroyed every particle of a figure which had taken him seventeen years to construct.

Professor Henry made a second communication on the subject of cohesion.

He had prosecuted his experiments on the soap bubble to a greater extent, and had arrived at a number of results which appeared to him of some interest in reference to capillarity, a subject which had given rise to a greater diversity of opinion than any other part of natural philosophy. As an evidence of its present unsettled state, he mentioned the fact, that the last edition of the *Encyclopædia Britannica* contained two articles on this subject, under different names; one by Dr. Young, and the other by Mr. Ivory, which explain the phenomena on entirely different physical principles.

According to the theory of Young and Poisson, many of the phenomena of liquid cohesion, and all those of capillarity, are due to a contractile force existing at the free surface of the liquid, and which tends in all cases to urge the liquid in the direction of the radius of curvature towards the centre, with a force inversely as this radius. According to this theory the spherical form of a dew-drop is not the effect of the attraction of each molecule of the water on every other, as in the action of gravitation in producing the globular form of the planets, (since the attraction of cohesion only extends to an unappreciable distance) but it is due to the contractile force which tends constantly to enclose the given quantity of water within the smallest surface, namely, that of a sphere. Professor H. finds a contractile force perfectly similar to that assumed by this theory in the surface of the soap bubble; indeed, the bubble may be considered a drop of water with the internal liquid removed, and its place supplied by air. The spherical force in the two cases is produced by the operation of the same cause. The contractile force in the surface of the bubble is easily shown by blowing a large bubble on the end of a wide tube, say an inch in diameter; as soon as the mouth is removed, the bubble will be seen to diminish rapidly, and at the same time quite a forcible

current of air will be blown through the tube against the face. This effect is not due to the ascent of the heated air from the lungs with which the bubble was inflated, for the same effect is produced by inflating with cold air, and also when the bubble is held perpendicularly above the face, so that the current is downwards.

Many experiments were made to determine the amount of this force, by blowing a bubble on the larger end of a glass tube in the form of the letter U, and partially filled with water; the contractile force of the bubble, transmitted through the enclosed air, forced down the water in the larger leg of the tube, and caused it to rise in the smaller. The difference of level observed by means of a microscope, gave the force in grains per square inch, derived from the known pressure of a given height of water. The thickness of the film of soap water which formed the envelope of the bubble, was estimated as before by the colour exhibited just before bursting. The results of these experiments agree with those of weighing the bubble, in giving a great intensity to the molecular attraction of the liquid; equal at least to several hundred pounds to the square inch. Several other methods were employed to measure the tenacity of the film, the general results of which were the same: the numerical details of these are reserved, however, until the experiments can be repeated with a more delicate balance.

The comparative cohesion of pure water and soap water was determined by the weight necessary to detach the same plate from each; and in all cases the pure water required the greater force. The want of permanency in the bubble of pure water is therefore not due to feeble attraction, but to the perfect mobility of the molecules, which causes the equilibrium, as in the case of the arch without friction of parts, to be destroyed by the slightest extraneous force.

Several other experiments with films of soap water were also described, which afford striking illustrations of the principles of capillarity, and which apparently have an important bearing on the whole subject of cohesion.

Professor Henry's communication gave rise to observations from Dr. Ludlow, Professor Frazer, and Mr. Trautwine.

On motion, the Librarian was authorized to present a copy of the Catalogue of the Library to the Academy of Natural Sciences of Philadelphia.